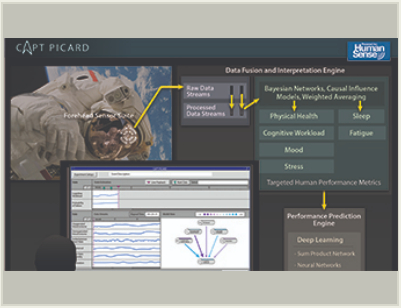
Small Business Innovation Research/Small Business Tech Transfer

Cognitive Assessment and Prediction to Promote Individualized Capability Augmentation and Reduce Decrement (CAPT PICARD), Phase II

Completed Technology Project (2016 - 2019)

Project Introduction

NASA missions include long periods of low workload followed by sudden high-tempo operations, a pattern that can be detrimental to situational awareness and operational readiness. An unobtrusive system to measure, assess, and predict Astronaut cognitive workload can indicate when steps should be taken to augment cognitive readiness. This system can also support testing and engineering (T&E); engineers can accurately evaluate the cognitive demands of new tools and systems, as well as how they affect task performance. In our Phase I effort, Charles River Analytics designed and demonstrated a system for Cognitive Assessment and Prediction to Promote Individualized Capability Augmentation and Reduce Decrement (CAPT PICARD). CAPT PICARD: (1) robustly and unobtrusively performs real-time synchronous data collection with a suite of sensors to provide a holistic assessment of the Astronaut; (2) extracts, fuses, and interprets the best combination of indicators of Astronaut state; (3) comprehensively predicts performance deficits, optimizing the likelihood of mission success; and (4) displays the data to support the information requirements of any user. The solicitation defined the following Phase I goals: review physiological, neurophysiological, and cognitive assessments in extreme environments and long duration missions; design an algorithm to assess workload. We did focus on these goals; however, we went beyond them to also demonstrate a functional prototype by the end of Phase I. Based on the success of this Phase I effort, we recommend a Phase II effort to refine and develop each component of CAPT PICARD, and iteratively evaluate this system in an undergraduate lab, at a T&E lab at Johnson Space Center (JSC), and in a mission-like analog environment at JSC. Successful completion of these tasks will result in a tool that can both dramatically improve Astronaut mission readiness and the design and development of tools Astronauts use to carry out mission objectives.



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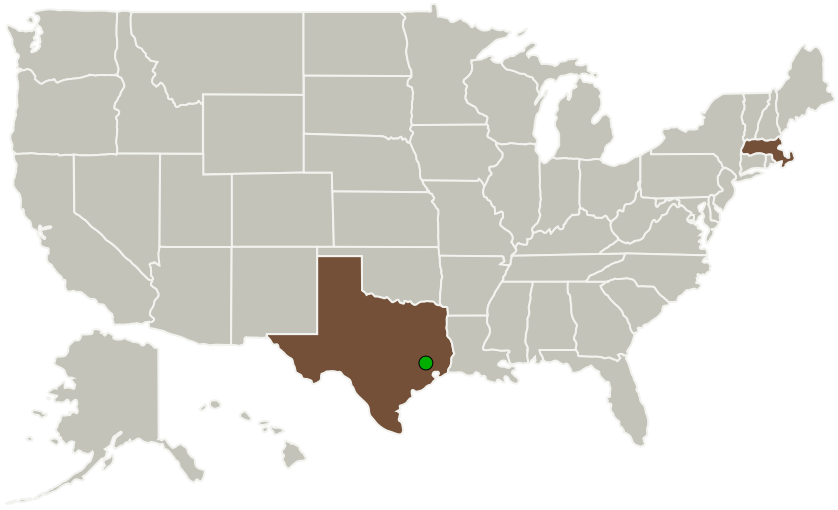
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Charles River Analytics Inc.	Lead Organization	Industry	Cambridge, Massachusetts
Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations	
Massachusetts	Texas

Project Transitions

June 2016: Project Start

March 2019: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139521)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Charles River Analytics Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

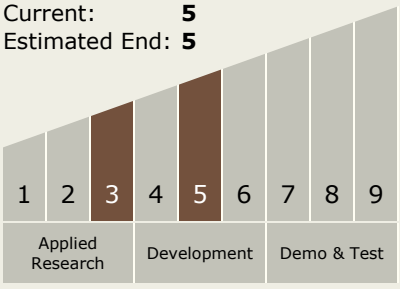
Carlos Torrez

Principal Investigator:

Bethany K Bracken

Technology Maturity (TRL)

Start: **3**
Current: **5**
Estimated End: **5**



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Images

Briefing Chart Image
Cognitive Assessment and Prediction to Promote Individualized Capability Augmentation and Reduce Decrement (CAPT PICARD), Phase II
(https://techport.nasa.gov/image/136100)

Final Summary Chart Image
Cognitive Assessment and Prediction to Promote Individualized Capability Augmentation and Reduce Decrement (CAPT PICARD), Phase II
(https://techport.nasa.gov/image/133067)

Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.6 Human Systems Integration
    - TX06.6.1 Human Factors Engineering

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System